HT-900 SERIES
HIGH THROUGHPUT ETHERNET BRIDGE

Addendum to the FreeWave Manual

V1.0h

Firmware Release Version 7.60

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Table of Contents:

Description: 3
Back Panel: 4
Front Panel: 5
Setup: 6
    Setup Menus 6
    Menu 1, ... 6
    Menu 1, Submenu F 6
    Menu 2, ... 7
    Menu 3 (for Point to Point) 7
    Menu 3 (for Point to Multipoint) 7
    Menu 5 (for Point to Multipoint) 7
Errata for Firmware Versions 8
Installation: 10
Troubleshooting: 10
Glossary of Terms: 11

Description:

This is an addendum to the Spread Spectrum Wireless Data Transceiver User Manual (the "Main Manual"). It covers details applicable specifically to using FreeWave HT Ethernet modems to create an Ethernet Bridge. Please note that this addendum does **not** apply to the HTP-900xx models of Ethernet radios. Please use this addendum in conjunction with the Main Manual. The Data Port in a FreeWave HT Ethernet Modem is a 10Base-T RJ45 connector, to be used as part of an Ethernet LAN (Local Area Network).

In order to conserve the available bandwidth, the FreeWave HT Ethernet Modems have a MAC address filter. Each packet received by the Ethernet interface from the LAN is checked for the destination MAC address against the filter table. If the address is contained in the table, the packet is not forwarded across the radio link. If the address is unknown, or known to be across the radio link, then the packet is forwarded. An address is only added to the filter table after the Ethernet interface positively determines that the MAC address in question is not across the radio link. Each entry in the table has a lifetime of 4.5 minutes, to facilitate changing network conditions, and roaming across networks.

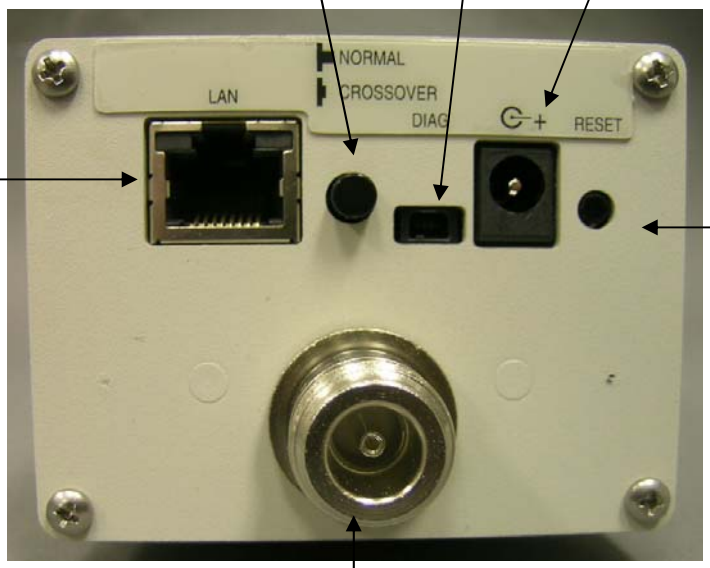
The HT Ethernet High Throughput Modem has a Data Transmission RF Bit Rate of 867kbps in Point to Point mode, 614kbps in Point to Multipoint mode.

Back Panel:

DIAG: 3-pin connector for diagnostics and programming of the radio. Diagnostic cable, part number ASC0409DC, is available from FreeWave.

NORMAL/CROSSOVER:
Switches the RJ45 connector from normal wiring to crossover wiring to avoid the need for a crossover cable.

POWER: 2.1 mm coaxial power connector. 6 – 30 V DC, center pin is positive.



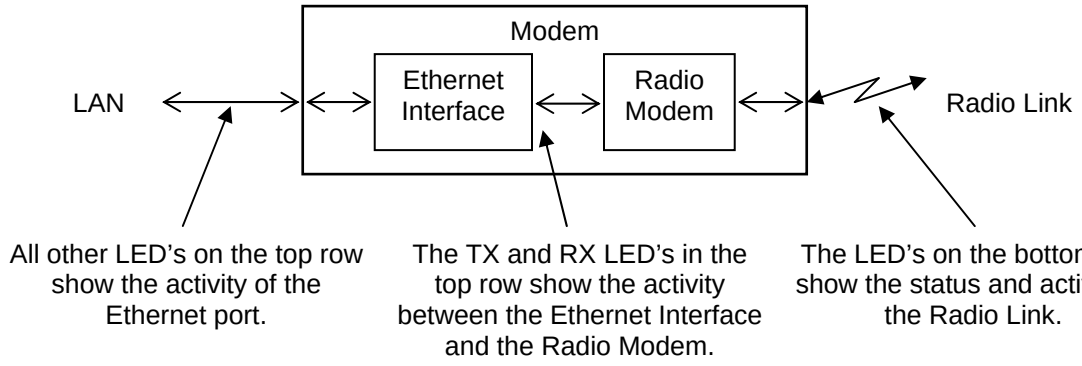
LAN:
RJ45 connector, for Ethernet 10Base-T network.

RESET:
Push button to reset the Ethernet interface, ONLY. (It does not invoke the Set-up mode)

ANTENNA: see Install Guide.

Front Panel:

The modem has 2 rows of LED's. The bottom row of LED's is described in the Main Manual. The top row has 7 LED's that indicate the state of the Ethernet Interface.
The Ethernet Modem has 2 major components: the Ethernet interface port (the Data Port) and the RF Modem (radio link). These devices must both be configured properly for the network to function.


Modem
LAN
Ethernet Interface
Radio Modem
Radio Link
All other LED's on the top row show the activity of the Ethernet port.
The TX and RX LED's in the top row show the activity between the Ethernet Interface and the Radio Modem.
The LED's on the bottom row show the status and activity of the Radio Link.

LINK: green = the modem is connected to its LAN.

TX: green = the modem is transmitting to another modem over the radio link.

RX: green = the modem is receiving from another modem over the radio link.

LTX: green = the modem is sending data to its LAN.

LRX: green = the modem is receiving data from its LAN.

COL: red flash = the modem saw a collision on the LAN.

ERR: red flash = the modem saw an error on the LAN

See Main Manual

Setup:

To program the modem, proceed as described in the Main Manual, with the following exceptions:

- **Capital U on the diagnostics port brings up the setup menu.**
- You must use the diagnostic port (there's no RS232 Data Port in this modem)
- You must select the following settings.

Setup Menus

NOTE: The Baud Rate setting is neither the over the air data rate of the Radio Link, nor the data rate of the Ethernet 10Base-T connection to the LAN. This Baud Rate strictly sets the protocol internal to the Modem, between the Ethernet Interface and the RF modem.

Menu 1,

SET BAUD RATE

Modem Baud is 1382400		**Must be "9"** (1382.4Kbps)
(0) 230,400		
(1) 115,200		
…		
(9) 1382.4KB		
(A) Data, Parity	0	**Must be "0"** (Default)
(B) MODBus RTU	0	**Must be "0"** (Disabled)
(C) RS232/485	0	**Must be "0"** (TTL)
(D) Setup Port	2	**Must be "2"*** (Diagnostics port used for Set-up)
(E) TurnOffDelay 0	TurnOnDelay 0	**No effect "0"** (Default for both)
(F) FlowControl	1	**Must be "1"** (CTS flow control)

Menu 1, Submenu F

Ethernet/IP Radio Setup

(0)	Ethernet Mode	1	**Must be set to "1"***
(1)	Half/Full Duplex	0	**Select either, depending on your network**
(2)	Slave IP Stack	0	**Must be set to "1"**
(3)	Slave UDP Mode	0	
(4)	IP Address	255.255.255.255	**Used for diagnostics only**
(5)	Port Address	4131	**Default Port Address**
(6)	IP Address 2	255.255.255.255	
(7)	Port Address 2	6535	
(8)	MAC Filter 0		**0 disables internal MAC filter. 1 enables.**

***NOTE**: Once the "Ethernet Mode" setting is set to 1 (Menu 0, Submenu F, Option 0), the "Set-Up Port" (Menu1, option D) can no longer be changed. Therefore, it is important to ensure the "Set-Up Port" is set at "2", prior to enabling the "Ethernet Mode".

Menu 2,

The Call Book is to be set as normal for Point to Point configurations. Network ID (Menu 5, option 6) is recommended for Point to Multipoint networks.

Menu 3 (for Point to Point)

RADIO PARAMETERS		
(0) FreqKey	5	
(1) Max Packet Size	9	**Recommended: "9" (for Asymmetric Data)**
(2) Min Packet Size	1	**Recommended: "1" (for Asymmetric Data)**
(3) Xmit Rate	1	
(4) RF Data Rate	2	Must be 2 if option B Delay (0-70) is invoked (set to anything other than 0)
…		
(A) High Noise	0	
(B) Delay (0-70)	2	**Used for range distance over 15 miles. All Radios in network must have the same value.**
(C) RemoteLED	0	
(D) WideBand	0	**Reserved for future use**.
(E) Encryption	0	**Enables 256 bit encryption, configurable in EZConfig only.**

Menu 3 (for Point to Multipoint)

RADIO PARAMETERS		
(0) FreqKey	5	
(1) Max Packet Size	9	**Recommended: "9" (for Asymmetric Data)**
(2) Min Packet Size	1	**Recommended: "1" (for Asymmetric Data)**
(3) Xmit Rate	1	
(4) RF Data Rate	3	**Must use: "3" for Multipoint networks**
…		
(B) Delay (0-70)	0	**Option not available in Multipoint Mode.**
(C) RemoteLED	0	
(D) WideBand	0	**Reserved for future use**.
(E) Encryption	0	**Enables 256 bit encryption, configurable in EZConfig only.**

Menu 5 (for Point to Multipoint)

MULTIPOINT PARAMETERS		
(0) Number Repeaters	1	**Set to "0"** (if none) **or "1"** (if any)
…		
(A) Slave/Repeater	0	**This function is not supported and therefore should not be used with Ethernet radios.**

* The new Option (B) Delay (0-70) has been created for the purpose of adjusting the timing of the radios when used at distances of over 15 miles. The value will increment by 1 for each 1.07 miles over 15 miles the longest link in the network accommodates. Throughput is reduced slightly for each increment of the Delay value. The Data Rate setting must be set to a value of 2.

NOTE: The Delay Setting MUST be the same in ALL Radios in the network.

Errata for Firmware Versions

The Following are known issues with Firmware version 2.54F:

- Firmware version 2.54F is the first release of HT firmware that is field upgradeable. This firmware also supports over the air firmware upgrades.

Point to Point Functionality
- Wideband mode is not operational.
- Slave/Repeater is not supported.
- Frequency Zones are not supported.
- Only 3 Frequency tables are available (0, 1 and 2).
- Serial Slave UDP mode is not Supported

Point to Multipoint Functionality
- Delay Option is not functional.
- Data Rate of 2 should not be used.
- Wideband mode is not operational.
- Slave/Repeater is not supported.
- Frequency Zones are not supported.
- Only 3 Frequency tables are available (0, 1 and 2).
- Serial Slave UDP mode is not Supported

The Following are known issues with Firmware version 2.55:

Overall (Point to Point and Point to Multipoint) Functionality
- Wideband mode is not operational.
- Slave/Repeater is not supported.
- Frequency Zones are not supported.
- Only 3 Frequency tables are available (0, 1 and 2). Note the full compliment of 7 (0-6) are selectable however, the only 3 Frequency tables that are supported are Standard, Australian and Standard 2.
- Serial Slave UDP mode is not Supported

Point to Point Functionality
Improvements:
- Bug fixed in Encryption. Encryption is Case Sensitive.
- Delay Distance feature functions but does not support Repeaters.

Point to Multipoint Functionality
- Delay Option is not functional.
- Data Rate of 2 is not supported.

Improvements:
- Bug fixed in Encryption. Encryption is Case Sensitive.

The following are known issues with Firmware version 2.58:

Overall (Point to Point and Point to Multipoint) Functionality

- Wideband mode is not operational.
- Slave/Repeater is not supported.
- Frequency Zones are not supported.
- Only 3 Frequency tables are available (0, 1 and 2). Note the full compliment of 7 (0-6) are selectable however, the only 3 Frequency tables that are supported are Standard, Australian and Standard 2.
- Serial Slave UDP mode is not Supported

Point to Point Functionality*:*

- Delay Distance feature functions, but does not support Repeaters.

Point to Multipoint Functionality

- Delay Option is not functional.
- Data Rate of 2 is not supported.

Improvements:

- Radio lock-up issue in networks with repeaters was resolved.

The following are known issues with Firmware version 7.60:

Overall (Point to Point and Point to Multipoint) Functionality

- Wideband mode is not supported
- Slave/Repeater mode is not supported

Point to Point Functionality:

- Delay Distance option does not support repeaters

Point to Multipoint Functionality:

- Delay distance option is not supported
- RF Data Rate of 2 is not supported

Improvements:

- Firmware revision number has been changed to 7.xx, to differentiate HT firmware from FGR firmware
- Frequency zones are now supported
- All hop table versions are now supported
- CTS lock-up issue has been resolved

Installation:

To install the modem, proceed as described in the standard FGR user manual, with the following exceptions:

- Connect the modem to the LAN with a CAT5 RJ45 Ethernet cable.
- Use the "Normal/Crossover" switch to select the polarity of the Ethernet connection. If connecting to a switch, router or hub, select "Normal". If connecting to a NIC or a modem, select "Crossover". However, if you are using a crossover cable, then use the opposite settings of the switch.
- If required, use the top row of LED's for troubleshooting the Ethernet Interface.

Troubleshooting:

To troubleshoot the modem, proceed as described in the Main Manual. Additionally, use the top row of LED's in this Ethernet modem as troubleshooting tools.

- No data is being passed between the LAN's.
  Upon power up, the Ethernet interface's MAC filtering table can become corrupted, and must be reset, or allowed to timeout. After power up, press the reset button on the back of the FreeWave Ethernet, or allow 4.5 minutes to pass and the table to reset.

- The LINK LED is off:
  The Modem has not successfully connected to the LAN.
  Make sure that the Modem is powered On.
  Make sure that the Ethernet device connected to the Modem is On.
  Make sure the Modem and the Ethernet device are connected with a good Ethernet cable.
  Try switching the "Normal/Crossover" switch to the opposite position.
  Ensure the Ethernet device is set for auto-detect, or 10BaseT.

- The TX LED stays on:
  Data is not successfully going from this modem's LAN to the other modem's LAN.
  Make sure the radio link is working (see Main Manual).
  Make sure both modems are linked to their respective LANs (modems' LINK LED's are on).

- The RX LED stays on:
  Data isn't going between this modem and its LAN.
  The Ethernet device to which this modem is connected isn't receiving data.

- The COL LED flashes:
  There are collisions on this modem's LAN.
  Collisions are normal when the modem is connected to the LAN is through a hub (it simply means that two Ethernet devices tried to send data through the hub at the same time). The Ethernet network is designed handle such collisions.
  Collisions do not happen when the modem is connected directly through a switch, a NIC, or a router.

- The ERR LED flashes:
  A data buffer is getting full.
  This typically occurs if the radio settings are incorrect. This also occurs when the radio link, or the LAN link are not present. Check the radio settings, the Radio Link, and the LAN link.
  Try pressing the Reset button on the back panel to reset the Ethernet Interface.

Glossary of Terms:

Ethernet Modem:	The entire FreeWave modem, which includes a Radio Modem and an Ethernet Interface.
Ethernet Bridge:	A bridge between two Ethernet LANs, using an Ethernet modem at each end.
Radio Modem:	The radio portion of the Ethernet Modem. It communicates with other radio modems.
Ethernet Interface:	The Ethernet portion of the Ethernet Modem. It translates and filters data between the LAN and the Radio Modem.
Radio Link:	The link between FreeWave radios.
LAN:	(Local Area Network): A computer network, such as Ethernet.
Collision:	The condition when one LAN device tries to transmit while another device is already transmitting.
NIC:	(Network Interface Card): A device that translates between a LAN and a computer, typically found inside a personal computer.
Switch:	A smart device for connecting many Ethernet devices together.
Router:	A smart device for directing the Ethernet packets from one network to another.
Hub:	A dumb device for connecting many Ethernet devices together.
Ethernet Device:	Any device that attaches to an Ethernet LAN, typically using an RJ45 connector.
Asymmetric Data	Data that flows primarily in one direction.